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FOREST RESEARCH NOTES

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
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CALIFORNIA FIRE WEATHER SEVERITY IN 1956

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The Fire Record

An unusually fine fire record had been hung up by the national forests in northern and central California by the middle of October 1956. Man-caused fires were well below average in number, and the area they had burned was remarkably small (fig. 1). The record put together by the southern California forests was only a little less outstanding at this time: area burned was less than half the previous 5-year average, and man-caused fires were fewer than usual. But in November, a series of fires nearly trebled southern California's burned acreage.

What role did fire weather play in making the good fire records possible in northern California? Can differences in fire weather explain the less favorable record in southern California? What set up the conditions resulting in the November fires there? Fire weather severity indices computed by California national forests can help answer these questions.

The Fire Weather Severity Index--What is it?

As burning conditions become more severe, the fire-control organization is faced not only with larger, faster-spreading fires, but also with the probability that more fires will start.[1/] The potential fire load increases at an ever faster rate as fire weather becomes worse.

The California fire danger rating index[2/] measures the day-to-day burning conditions and indicates how individual fires will behave. In contrast, the fire weather severity index measures the potential fire load by evaluating the effect of each level of fire danger on number and size of fires. When compiled cumulatively and compared with a standard condition, the severity index shows the relative severity of the fire season at any date.

1/ Countryman, C. M., and Intorf, P.H. A fire season severity index for California national forests. Calif. Forest & Range Exp. Sta. Misc. Paper 14, 7 pp. 1953.

2/ U.S. Forest Service. 1955 Fire Danger Rating Region 5. 11 pp. plus appendix.

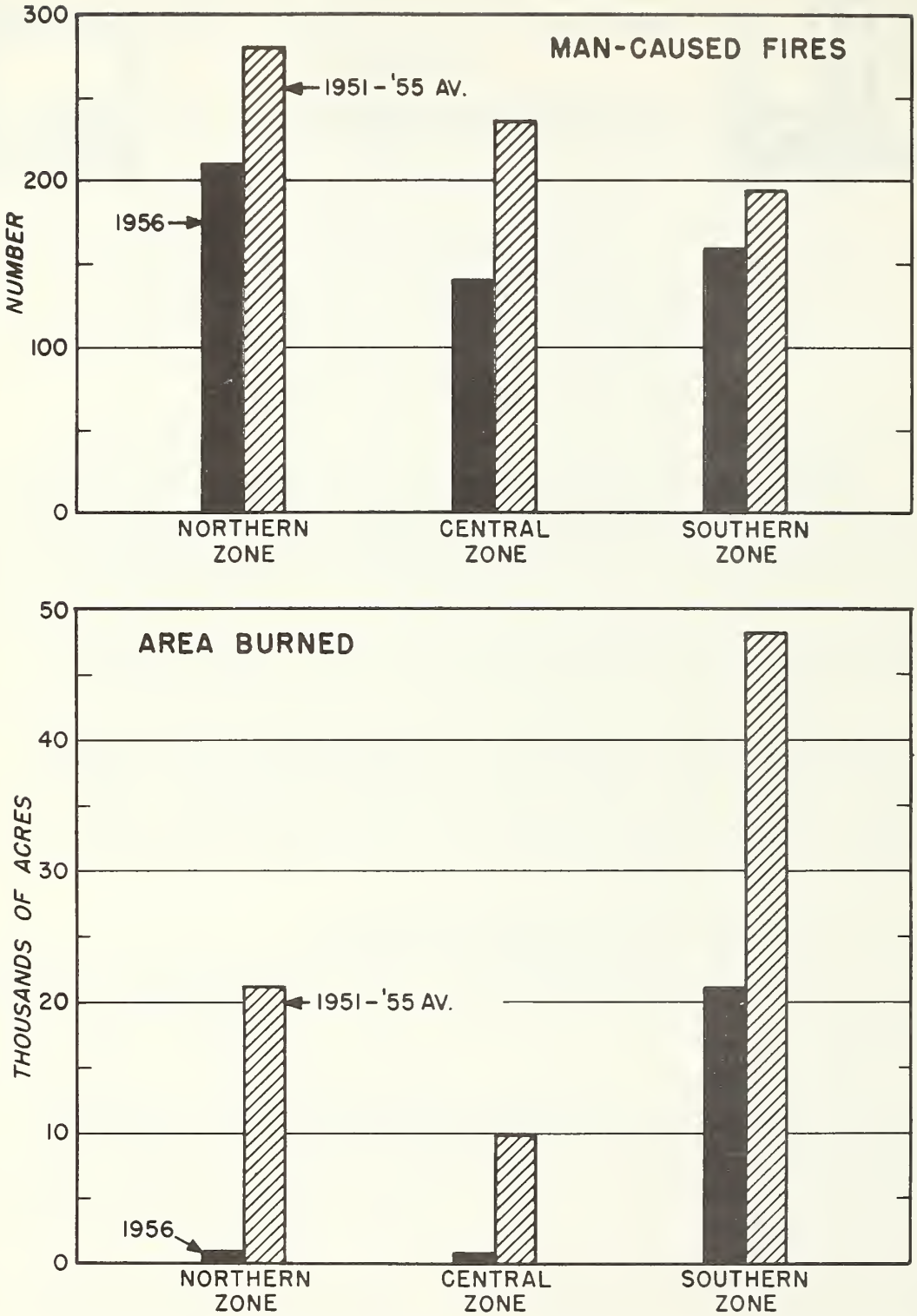


Figure 1.--Number of man-caused fires and area burned in California, 1956. 1951-55 average (January 1-October 15.)

A Regional Severity Index

In California, fire danger ratings are determined daily for individual rating areas into which the national forests have been divided. Direct comparison of these numerical ratings among areas is not possible under the California system. Hence fire weather severity indices derived from the ratings cannot be compared directly. To give a uniform base for comparison, a severity index was computed for each rating area assuming the average fire danger occurred every day. The ratio of the actual severity index to the assumed index was then obtained. These ratios express the fire weather severity relative to that normally experienced for the area--a measure that can be compared directly between areas. The ratios have been grouped into five classes of fire weather severity: low, medium, high, very high and extreme.

For 1956 fire weather severity indices have been computed for the period July 1 to October 15.

The 1956 Fire Weather Severity

Fire weather severity indices for most rating areas in northern and central California fell into the low or medium classes (fig. 2). The "easy" fire weather in these areas is reflected in the relatively small number of man-caused fires and the exceptionally low burned area as compared with the previous 5-year average.

In southern California the fire weather was much more severe. Most of the danger rating areas fell into the high, very high, or extreme classes. Both number of man-caused fires and acres burned were a substantially larger percentage of the 1951-55 average than in northern and central California. The largest fire up to October 15, the McKinley Mountain Fire, San Bernardino National Forest, made up nearly half of the total acreage burned; it occurred in one of the rating areas having an extreme severity index.

Other Uses of the Index

Fire weather severity ratings were used as part of the regional fire danger rating for the first time in 1956. This experience suggests that besides providing a comparison of fire weather season by season, they have two other important uses: during the fire season, the index computed by each rating area can be used to...

...detect a build-up of severe burning conditions

...show how the seasonal trend differs from that during other years.

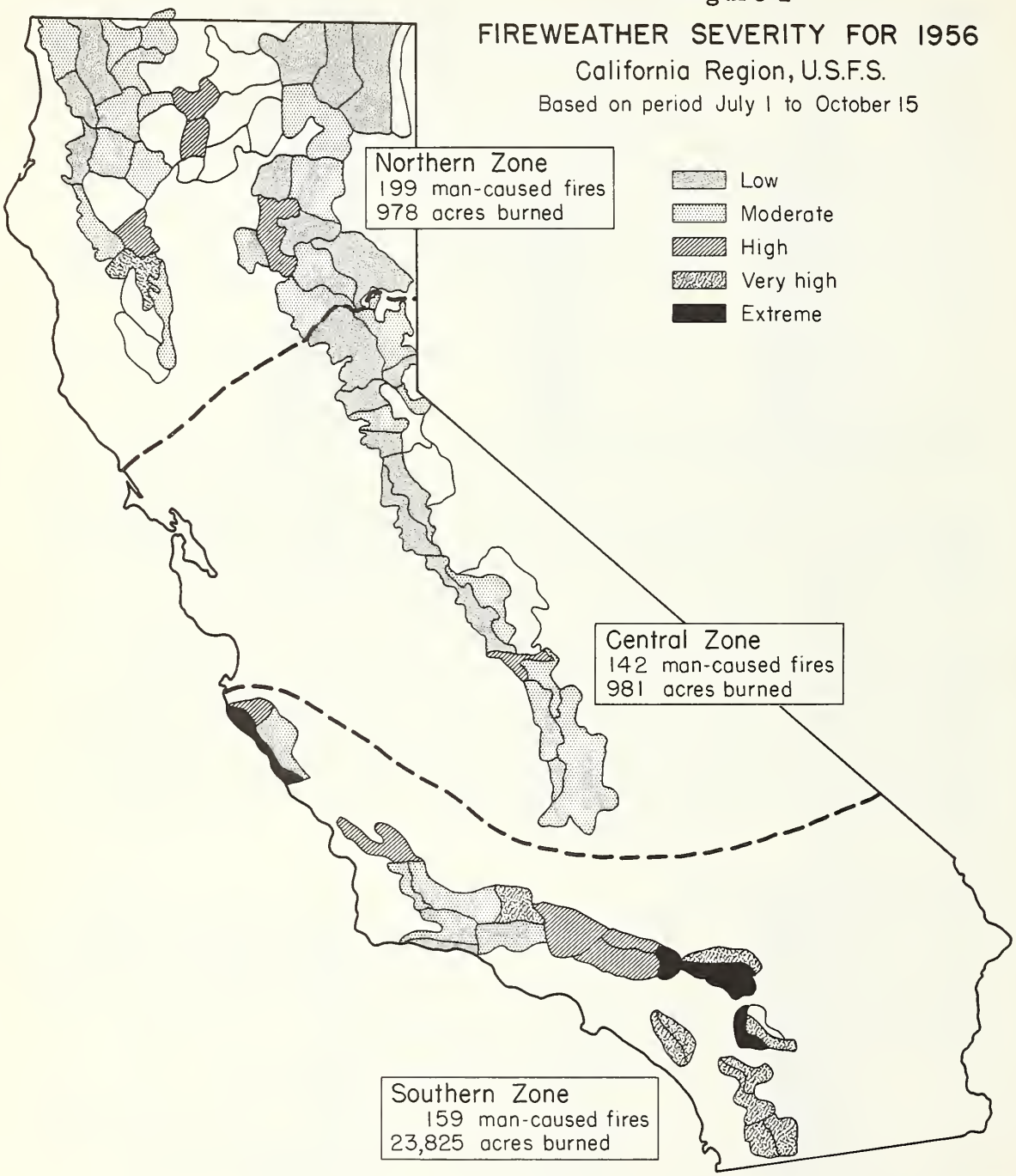
The record for a northern and a southern forest illustrates the evidence for this conclusion.

Figure 2

FIREWEATHER SEVERITY FOR 1956

California Region, U.S.F.S.

Based on period July 1 to October 15



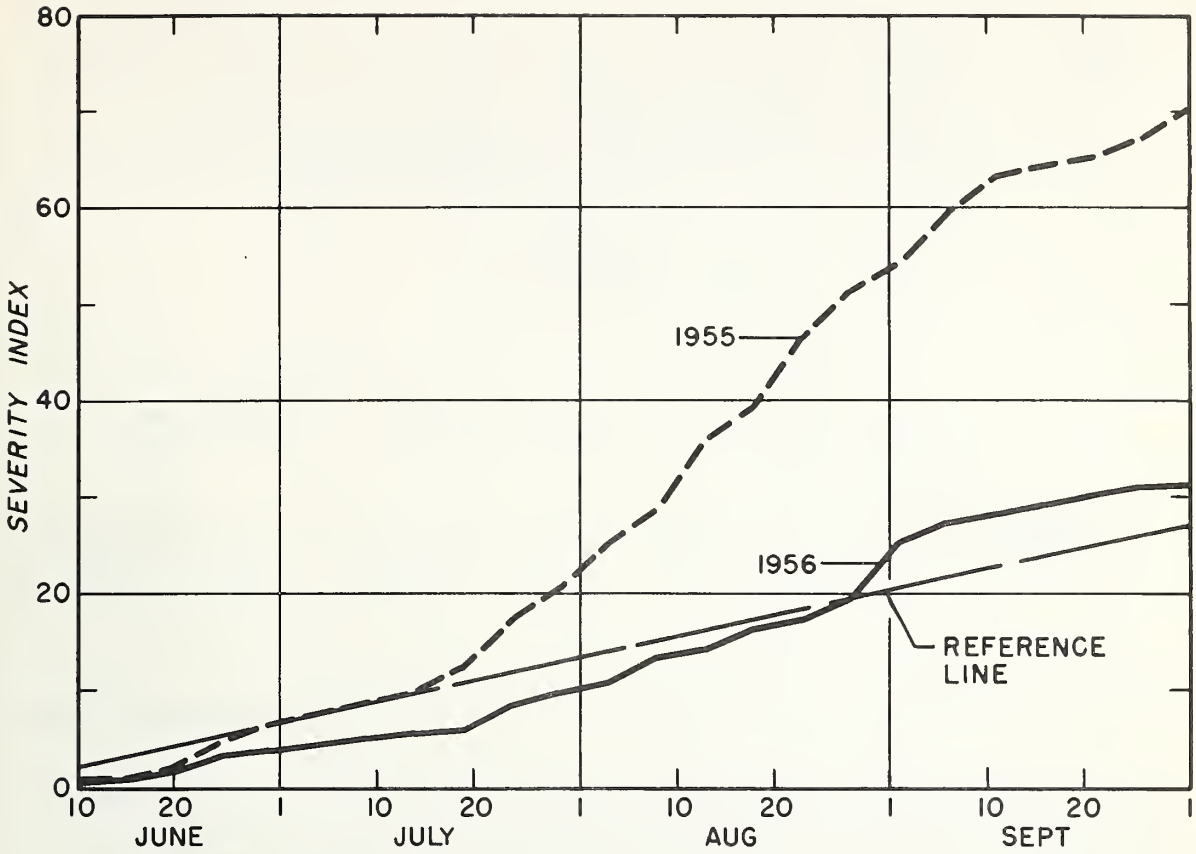


Figure 3. --Fire weather severity, Area 3 Lassen National Forests, 1955 and 1956.

Rating Area 3 on the Lassen National Forest is representative of conditions in northern California. There the cumulated severity indices for 1956, plotted by 5-day periods, are close to a reference line obtained when the average fire danger is assumed to occur every day. The 1956 indices also have about the same slope (fig. 3). This would indicate that the fire danger in 1956 was seldom in the higher classes and there was little tendency for unusual drying conditions to develop.

In contrast the curve for 1955 diverged sharply upward from the reference line after July 15. The steady trend of this curve away from the reference line could be caused only by fire dangers consistently above average. The potential for large fires would become increasingly great as the season progressed under this condition. Preliminary studies of 1955 conditions showed similar curves in other northern California areas.[3/] The more than 100,000 acres burned in northern California in 1955 compared with less than 1,000 in 1956 bears out the significance of seasonal severity ratings.

3/ Countryman, Clive M. Fire season severity in 1955 on the Klamath National Forest. For. Res. Note No. 103, Calif. Forest & Range Exp. Sta. 7 pp., illus. 1956.

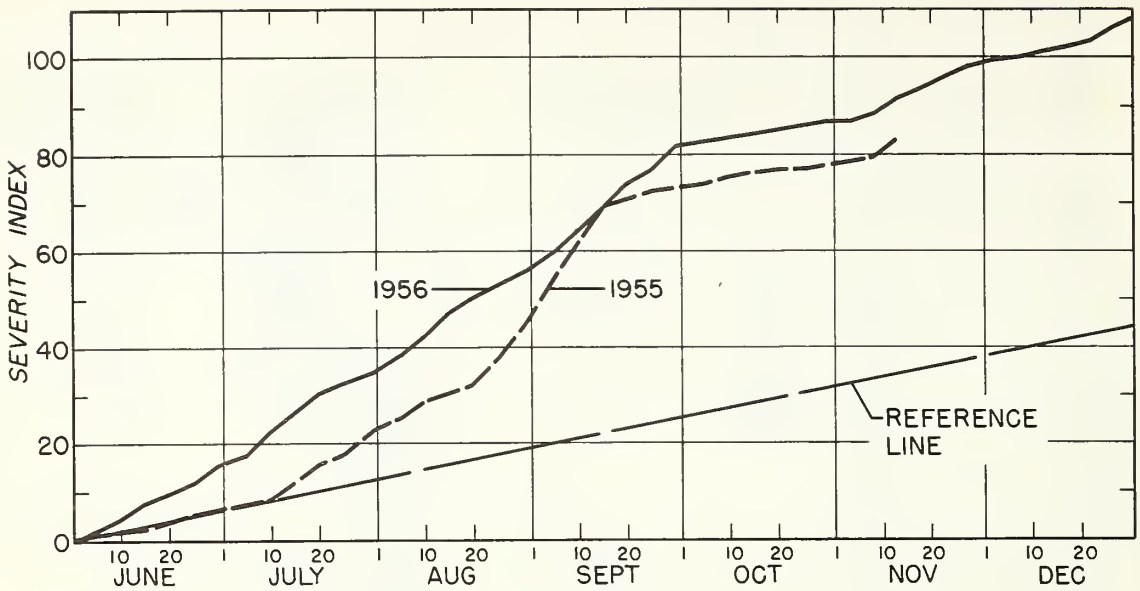


Figure 4.--Fire weather severity on Area 1 of San Bernardino Forest.

Rating Area 1 on the San Bernardino National Forest is representative of conditions in most of southern California. Here the severity index for the entire season up to October 15 was about the same in 1955 as in 1956. Plotted by 5-day periods, however, the cumulative totals show the two seasons to be quite different (fig. 4). The 1955 curve began diverging from the reference line about July 10 but resumed a slope parallel to the reference by September 10. A very sharp rate of increase in the last part of August and first part of September accounted for most of the high index in 1955. Thus the 1955 season was relatively easy except for a short period in which fire danger was unusually high.

In 1956, however, the severity index curve began diverging from the reference line early in the season and continued to climb rapidly to a high level. The extreme dryness brought about by the continual high danger made the potential fire load very great over an extended period of time. We would expect, then, an unusually large number of fires and an excessive burned area in southern California national forests. Unfortunately this potential fire load was confirmed by the fire behavior and control difficulties experienced in the McKinley, East Highland, and Inaja fires.

Conclusion

Originally designed only for comparing severity of seasons, fire weather ratings have demonstrated they also have value in detecting buildup of severe burning conditions. More experience in their use and interpretation undoubtedly will reveal other applications in fire-control planning.